Aquifer Storage and Recovery

Aquifer storage and recovery (ASR) is a water management technique that uses an injection well to temporarily place surface water or treated drinking water directly into an aquifer for storage. The injected water is then recovered from the aquifer, most often by means of the same well, as it is needed. In some settings, ASR may be an effective way to manage the seasonal peaks in water demand that confront many drinking water utilities. Use of ASR can prove to be a lower cost alternative to the other more traditional engineering approaches that would involve constructing more above ground water storage facilities or surface water reservoirs, drilling additional water supply wells, or expanding the output capacity of a utility's water treatment plant.

Water systems using ASR must be carefully evaluated and designed. The water to be injected must often be conditioned (dechlorinated, deoxygenated, pH adjusted, etc.) prior to its placement underground in order to avoid adverse chemical interactions with the mineralogy of the bedrock of the receiving aquifer. Mobilization of metals such as arsenic and manganese has been observed at a number of ASR sites in the United States. In-situ formation of trihalomethanes (chlorinated compounds such as chloroform, bromoform, etc.) has also been reported at ASR sites where drinking water containing a chlorine residual from water disinfection practices has been injected. A number of these elements and compounds have been determined to be carcinogenic.

Administrative rules in Chapter NR 811, Wis. Admin. Code, regulate the use of ASR wells in Wisconsin. The rules were promulgated to ensure that the quality of public drinking water supplies is maintained and to protect the state's groundwater and surface water resources from any harm that may result from ASR activities. Only municipal water systems are allowed to construct ASR wells and only water piped directly from a municipal water distribution system may be injected into an ASR well. Demonstration testing is also required before routine operation of an ASR well or ASR system may be approved by the DNR.

To date, only the municipal water utilities serving Oak Creek and Green Bay have sought approval to construct ASR wells in Wisconsin. The Oak Creek utility completed the required demonstration testing and received conditional approval to operate its ASR well in 2004. However, after several operational ASR cycles, the concentrations of iron and manganese in groundwater at the ASR well site increased to levels that exceeded the respective groundwater quality enforcement standards for those elements. In 2011 the utility discontinued ASR operations and, instead, expanded its surface water treatment capability.

In Green Bay ASR was pilot-tested , but yielded water with significant concentrations of arsenic and other contaminants, mobilized from the rock matrix of the aquifer. The Green Bay utility suspended ASR-related activities after arsenic and other metals were mobilized during the initial stages of the required ASR demonstration test. .The Green Bay Water Utility stopped pursuing an ASR well after learning that the Central Brown County Water Authority would construct a pipeline and purchase drinking water from the Manitowoc Water Utility rather than buy additional drinking water from the Green Bay utility.